



*Conceptual Models of the
Mission Space:
Communicating Warfighter Requirements
to Systems Engineers*

Jack Sheehan (ARL:UT)
DMSO Data Engineer
703-998-0660 x448
jsheehan@msis.dmsomil

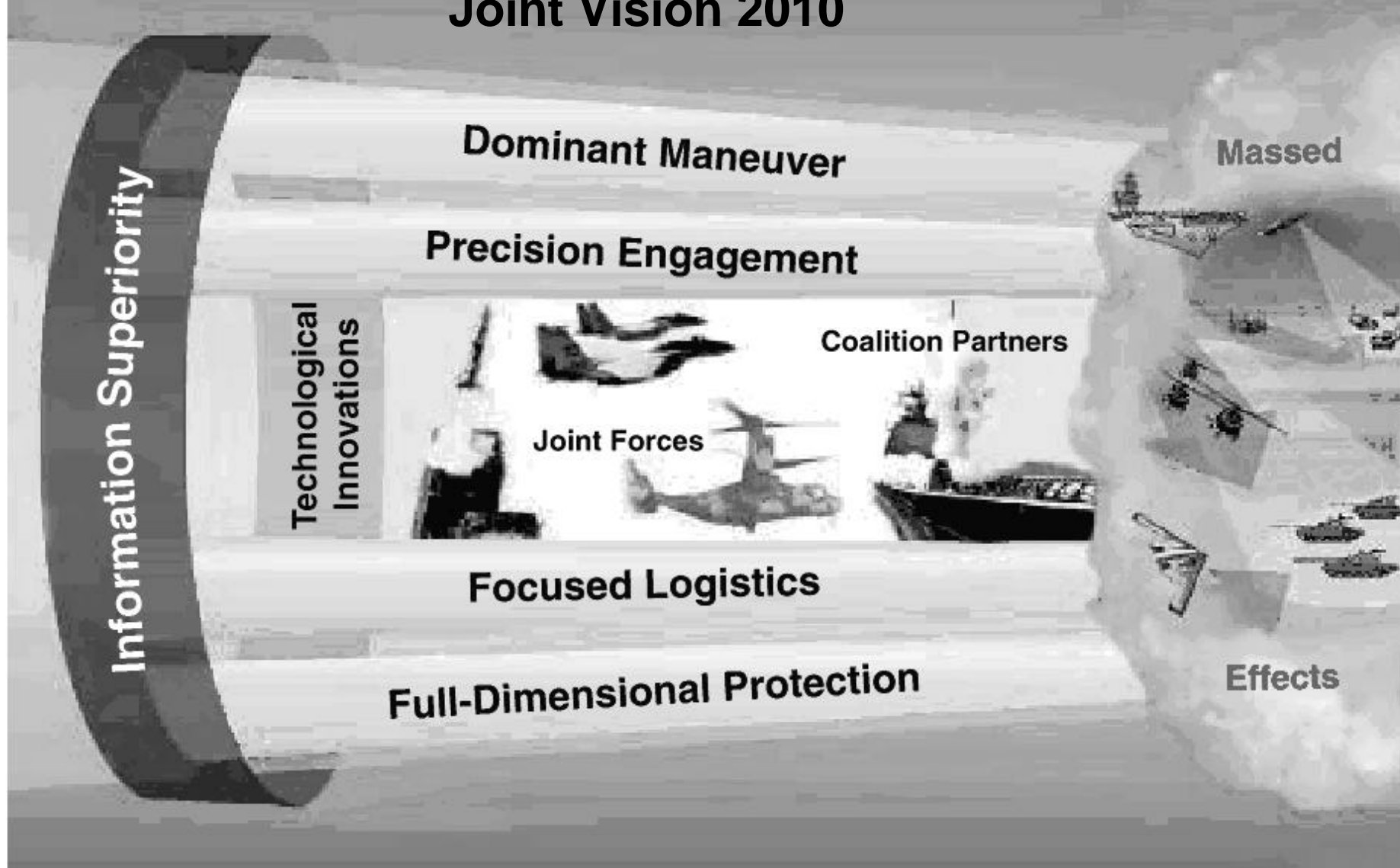
Bruce Harris (DRC)
DMSO CMMS User Advocate
978-475-9090 x1878
harris.bruce@drc.com

Outline

- ➔ • What is the Problem to be Solved
 - Joint Vision 2010 Context
 - Simulation Development Thread
 - The Nature of the Problems and Solutions
- Training Example
 - Joint Training System (JTS) Context
 - JSEAD Mission Thread
 - Warfighter-to-Engineer Communication
- Test & Evaluation Example
 - Analysis of Alternatives (AOA) Context
 - JSEAD Mission Thread
 - Engineer-to-Warfighter Communication

Emerging Operational Concepts

Joint Vision 2010



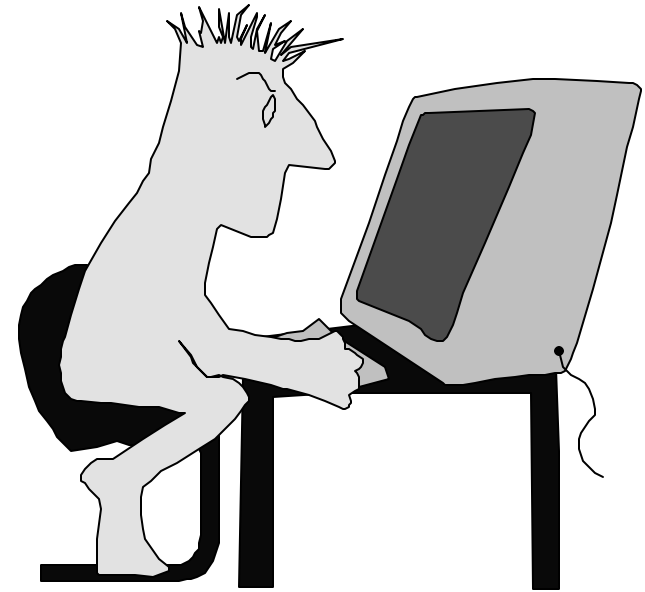
Communicating Mission Space Knowledge: One Way

- Warfighter: FO calls in mission. FA Btty fires it.
- Developer: What's an FO?
- Warfighter : Forward Observer -- the guy
with the grunts that has a DMD.
- Developer: What's a DMD?
- Warfighter : Digital Message Device -- the FO uses
it to send in Fire Requests to the FIST.
- Developer: What's a FIST?

Ambiguity is an Issue



FO calls in mission.
FA Btty fires it.

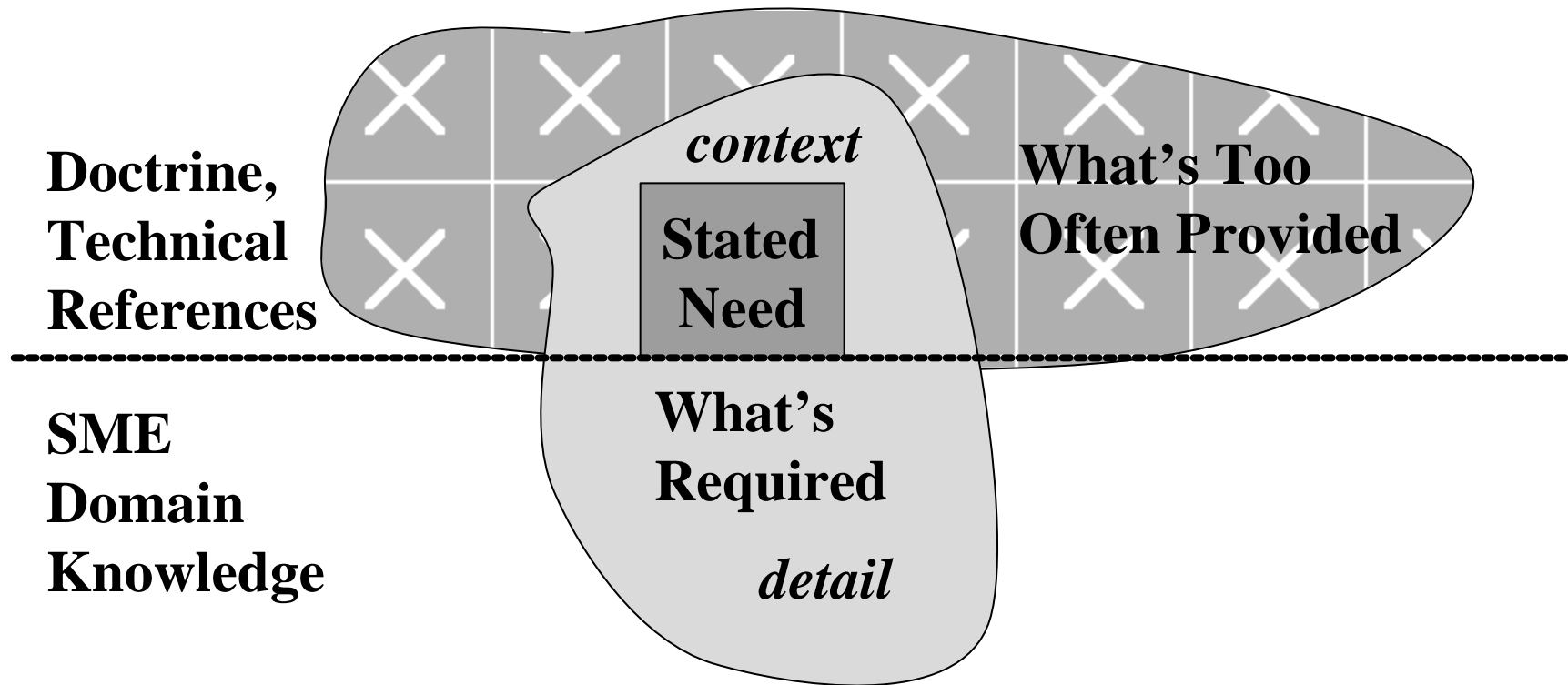


Is he calling the priest to
warn him that he's going to
set the mission on fire?



But why is the church burning?

Available Information: Too Much and Too Little



CMMS Problem Summary

- Simulation/federation developers invest considerable resources in acquiring knowledge about the real world to be synthesized.
- Key problems are:
 - authoritative information is not readily available.
 - the mission space knowledge acquired is incomplete for simulation development or ambiguous to the developer.
 - knowledge acquired (at considerable expense) is not retained for future use (fostering unnecessary duplication).
- If a functional description of an entity (or process) is not available to the developer, odds are that the entity (or process) will not be represented (or correctly represented) in the simulation.

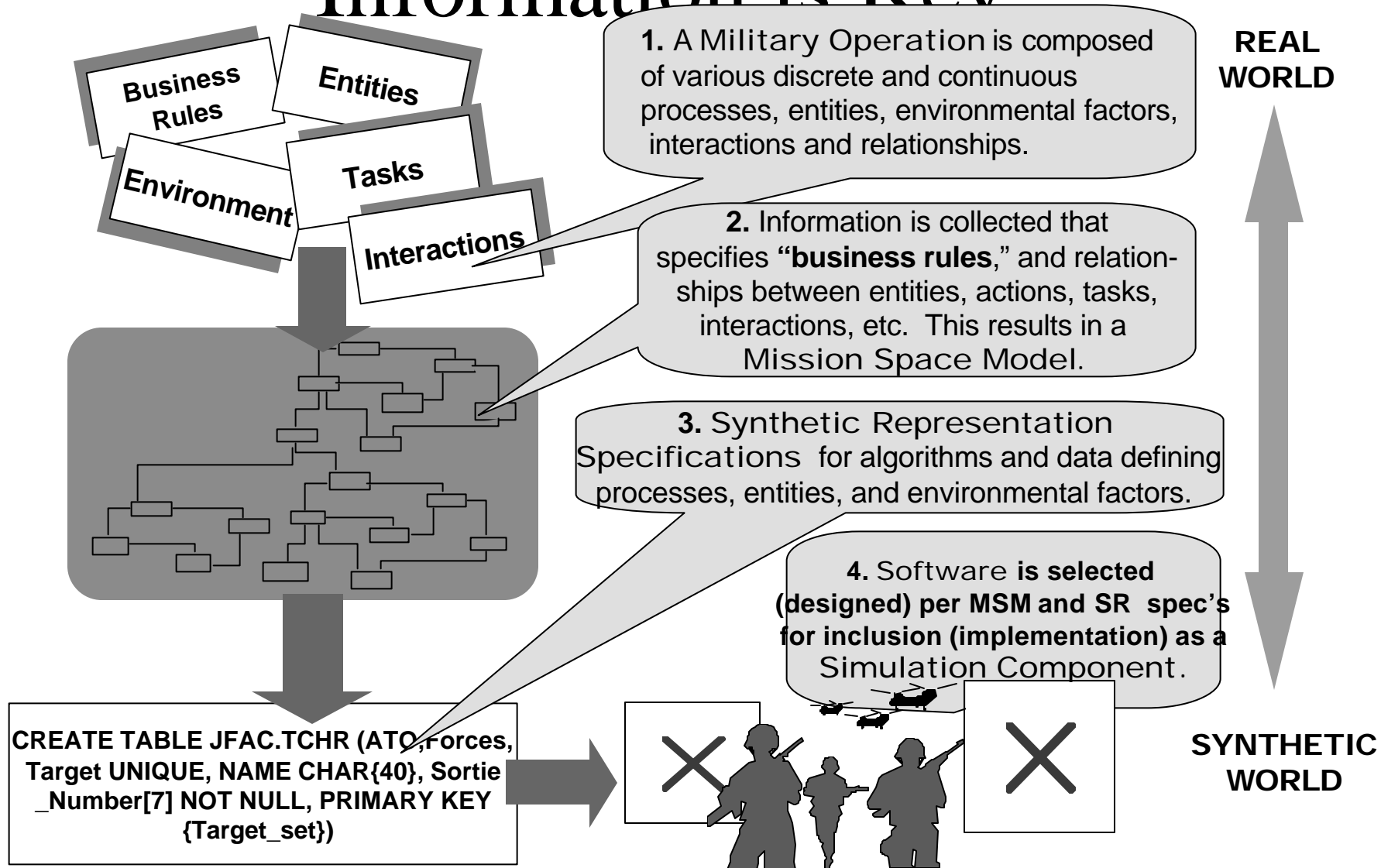
Perspectives

- The Warfighter cares about Credibility.
- The Developer cares about Completeness.
- The Program Manager cares about Cost.

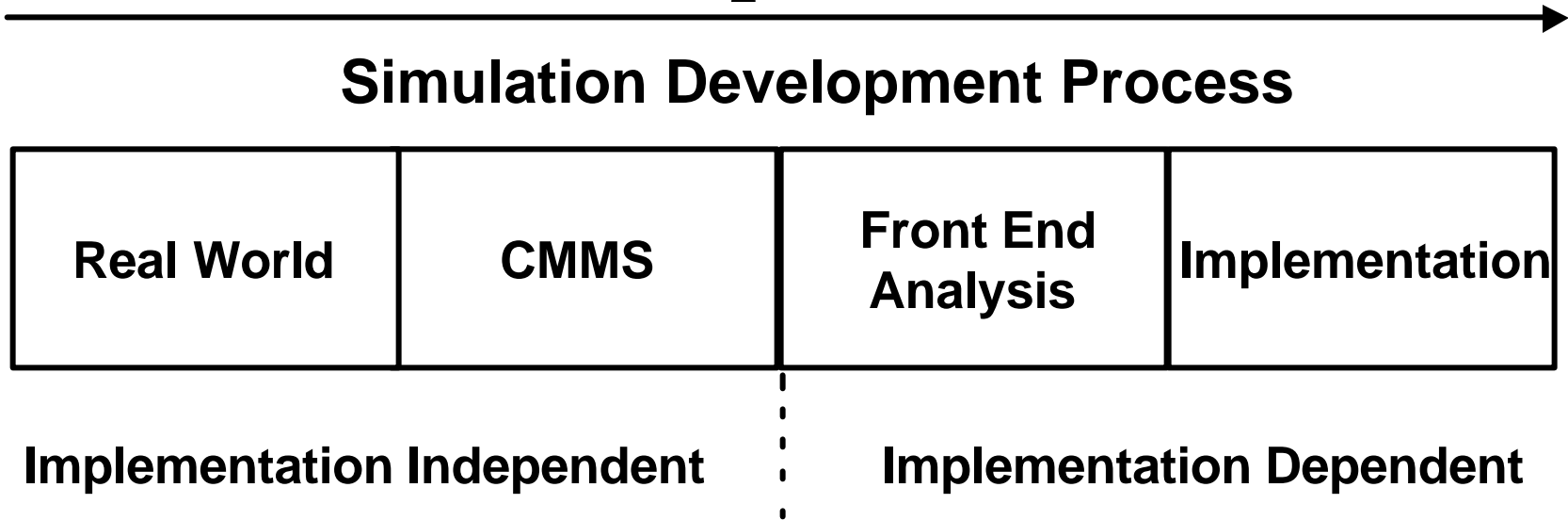
Achieving all three requires a focus on
Composability

Structuring Mission Space

Information is Key



Conceptual Models of the Mission Space



CMMS is the Bridge Between the Warfighter and Engineer

- Conceptual Models: consistent description of real world military operations
- Technical Framework: standards for knowledge capture and integration
- Common Repository: DBMS for management and release

Outline

- What is the Problem to be Solved
 - Joint Vision 2010 Context
 - Simulation Development Thread
 - The Nature of the Problems and Solutions
- Training Example
 - Joint Training System (JTS) Context
 - JSEAD Mission Thread
 - Warfighter-to-Engineer Communication
- Test & Evaluation Example
 - Analysis of Alternatives (AOA) Context
 - JSEAD Mission Thread
 - Engineer-to-Warfighter Communication



CJCS Demonstration Thread

JSEAD Exercise under the JEMP-III Joint Training System (JTS)

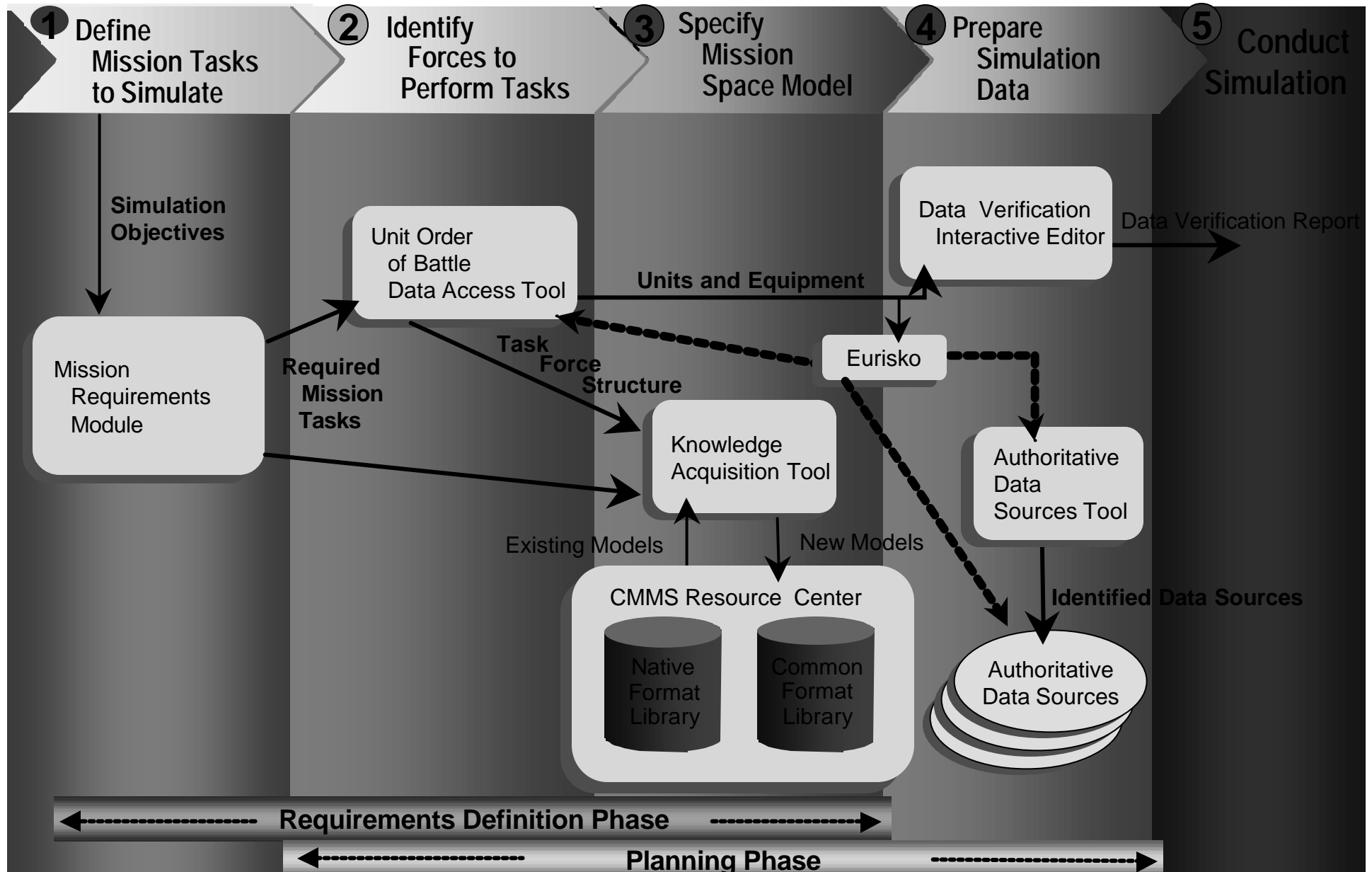




CMMS Demonstration Architecture



Joint Suppression of Enemy Air Defenses

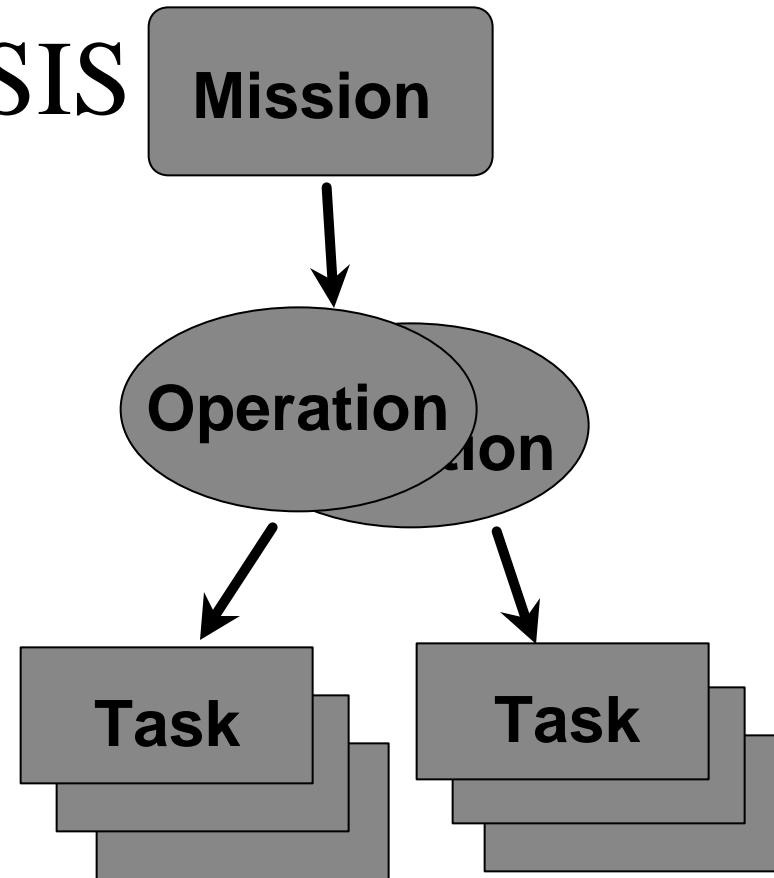


JOINT TRAINING SYSTEM

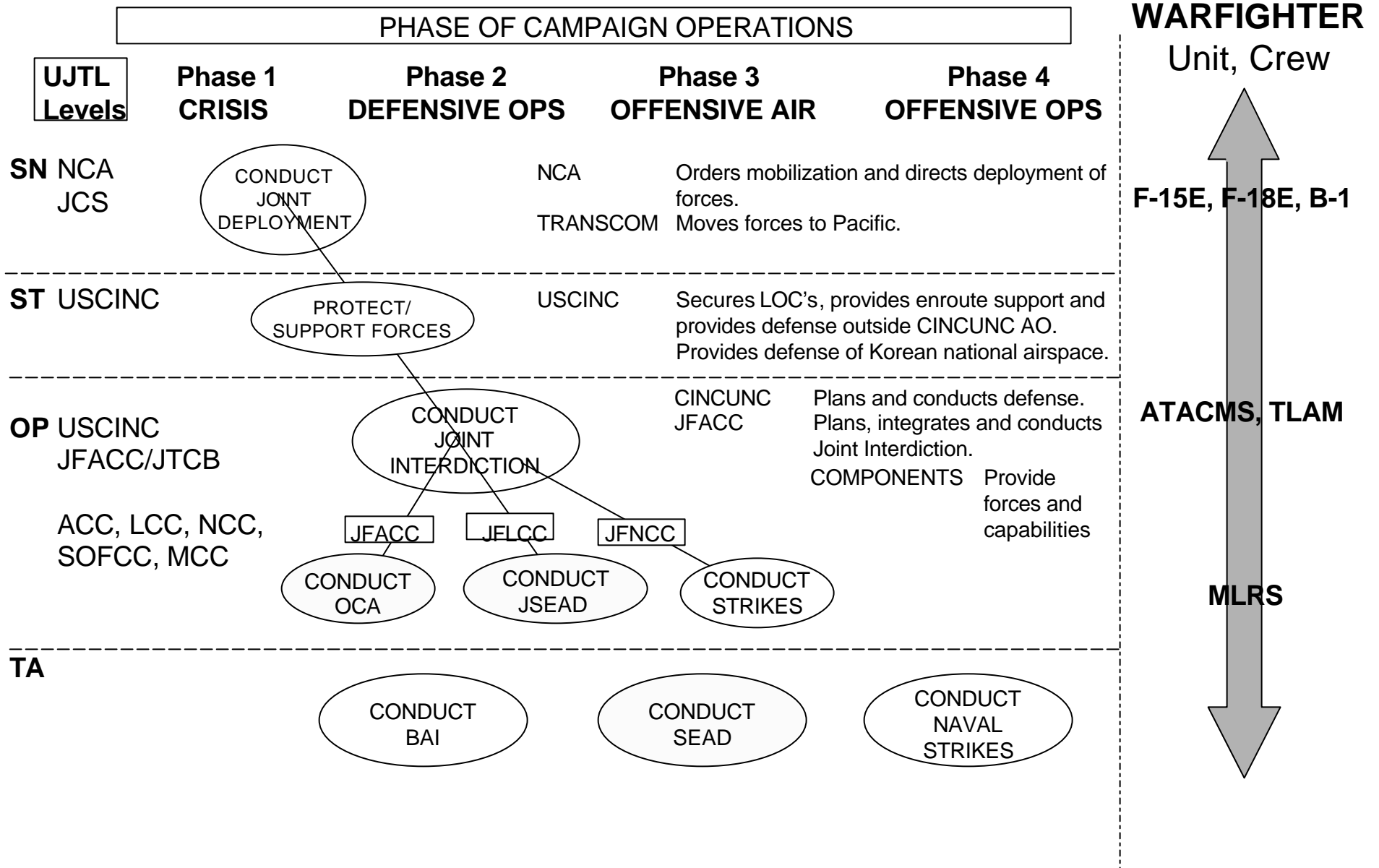


CONDUCT MISSION

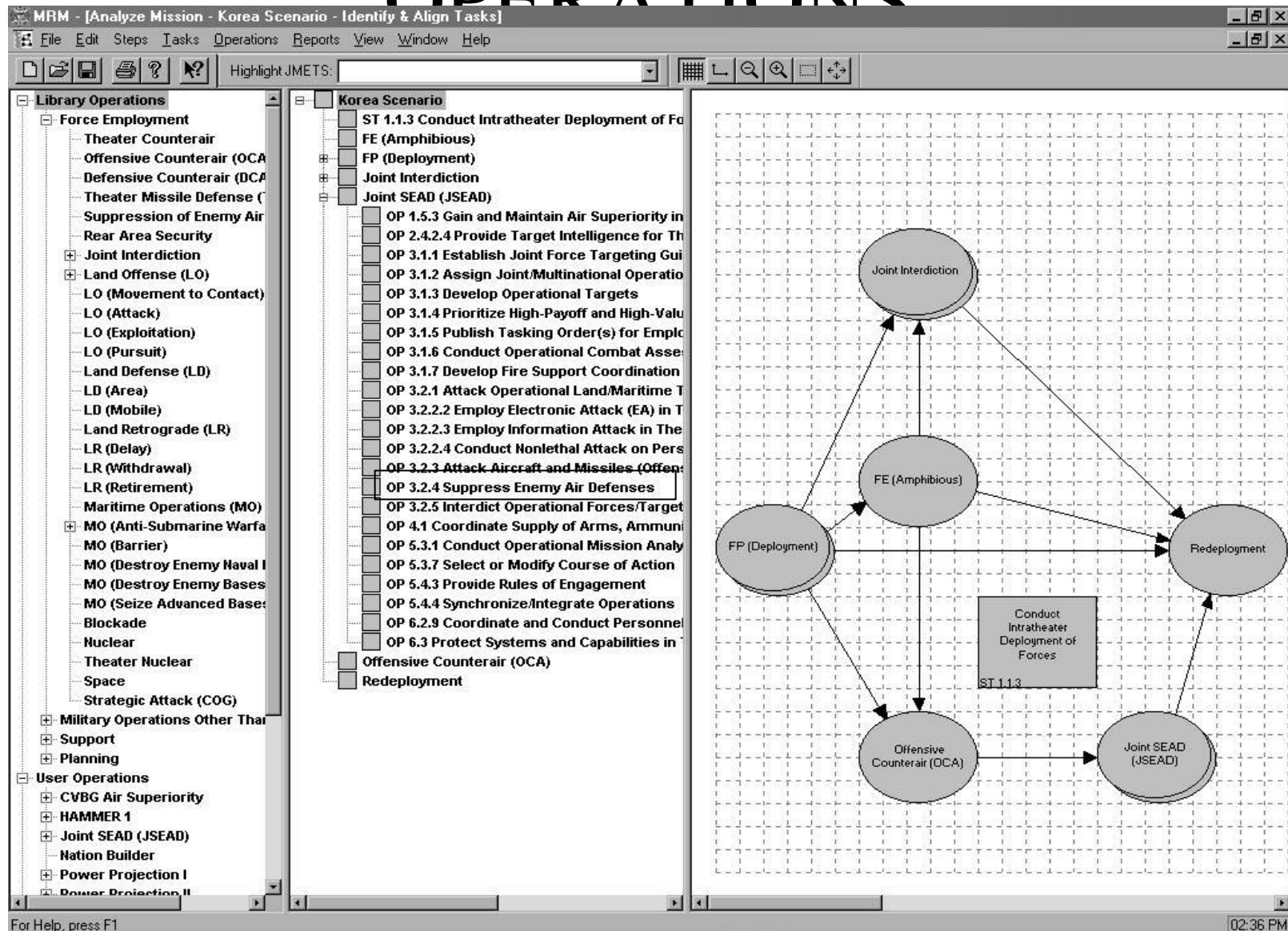
- Mission is assigned to CINC. Concept of operations may include a number of operations.
- Operations, the building blocks of mission planning, are comprised of multiple tasks.
- Tasks are the fundamental building blocks of missions, and are executed by specific units or organizations.



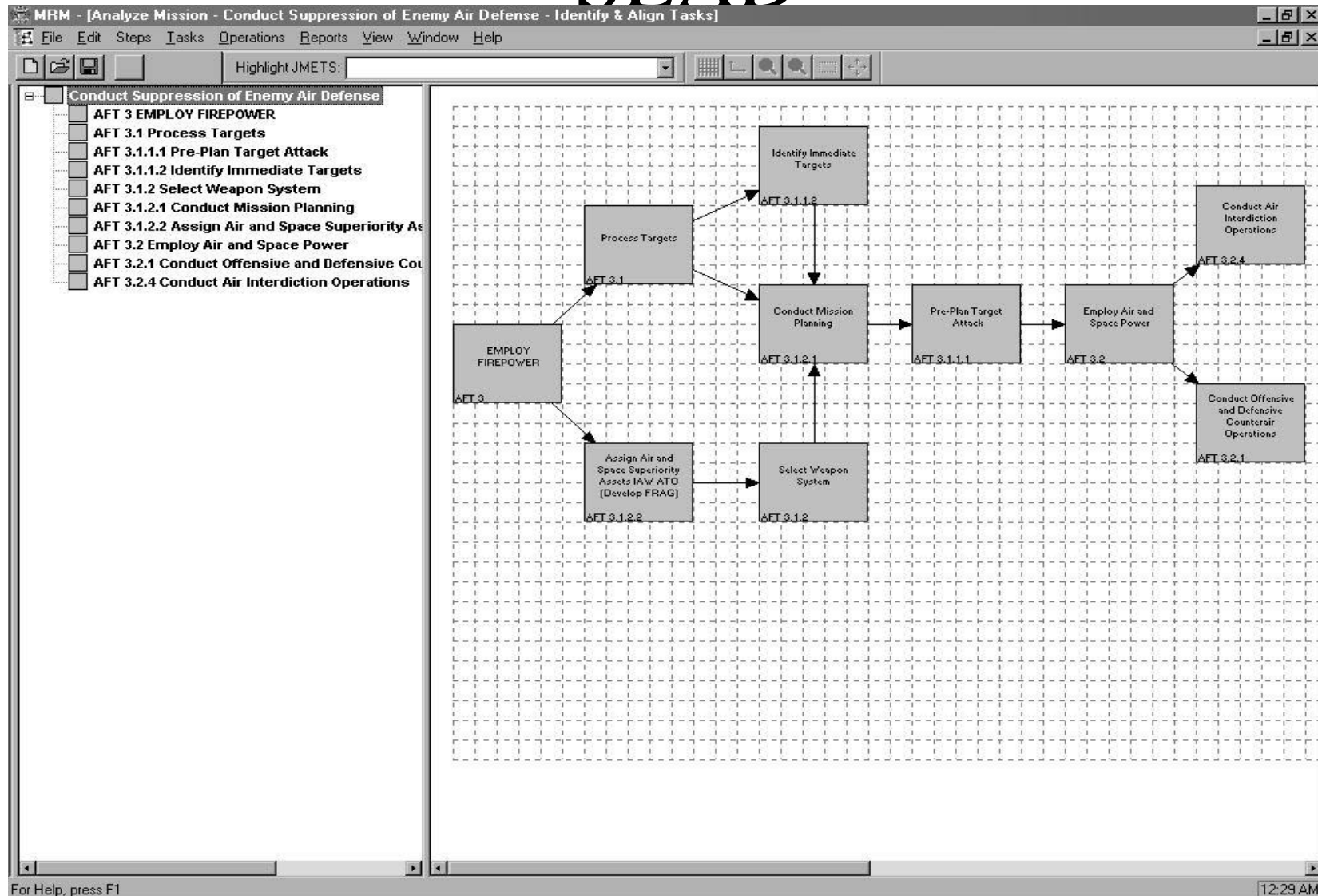
MISSION THREAD



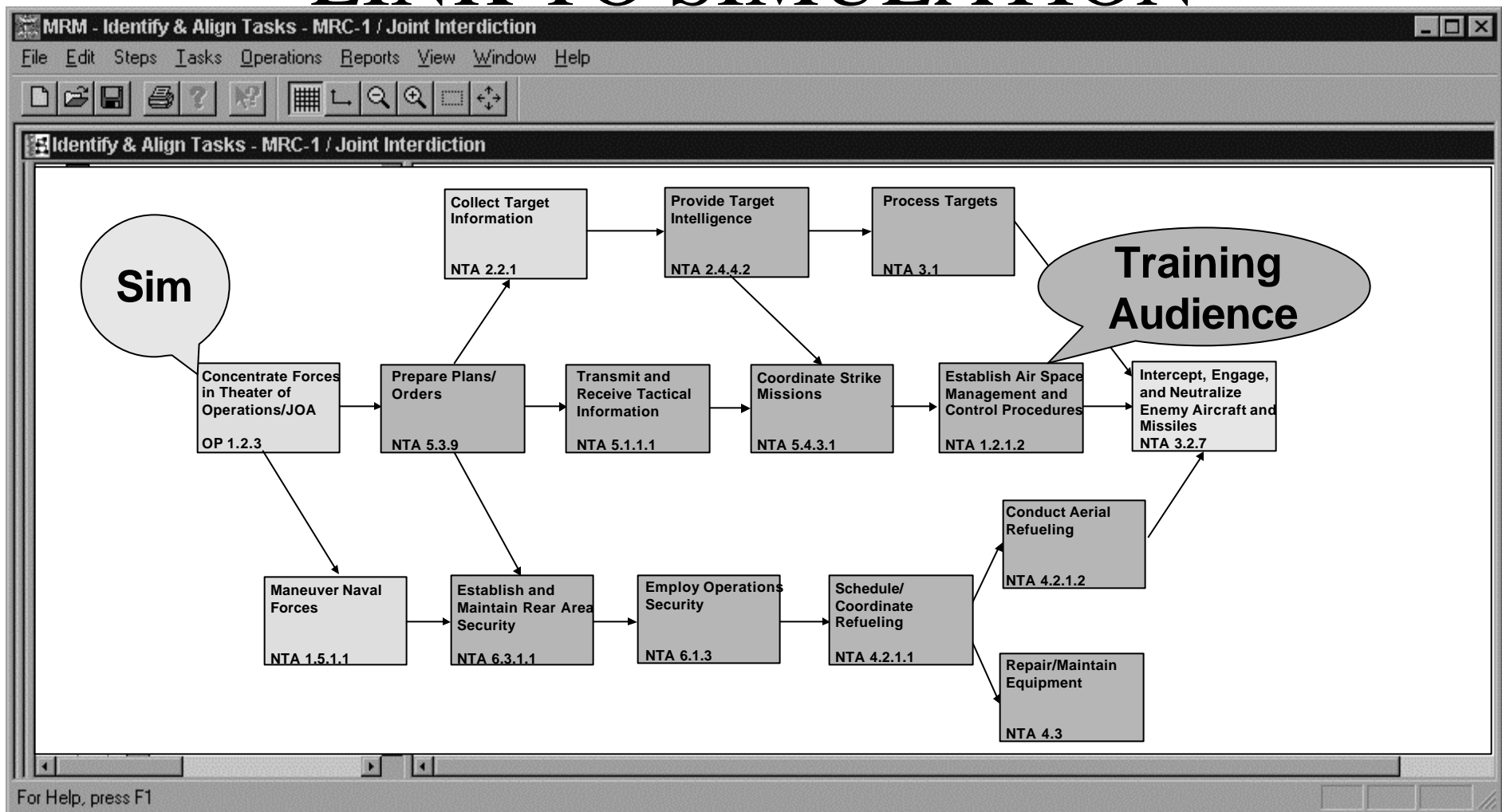
ANALYZE MISSION - SEQUENCE OPERATIONS



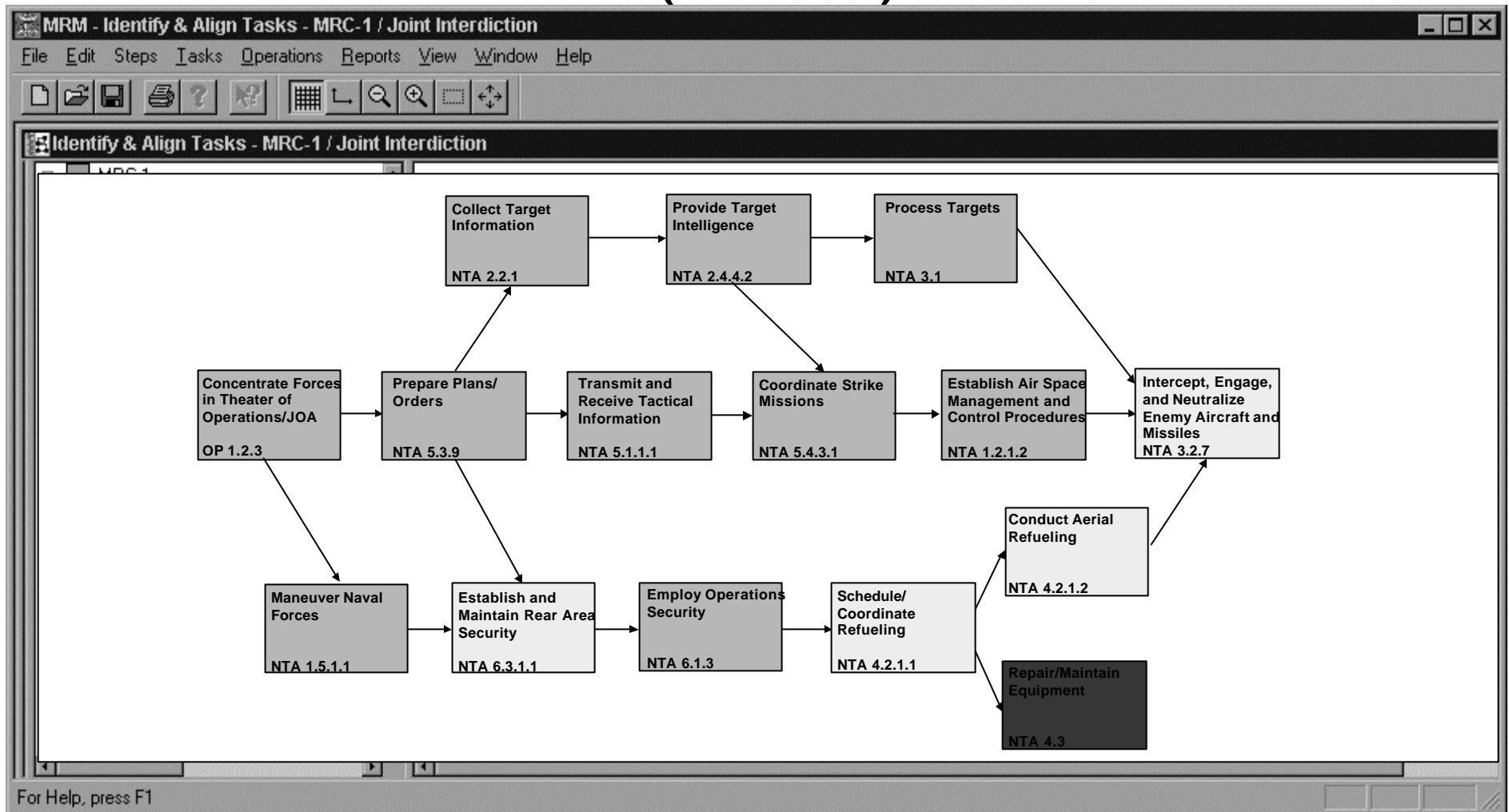
ANALYZE OPERATIONS - CONDUCT SEAD



DESCRIBE EXERCISE SCENARIO & LINK TO SIMULATION



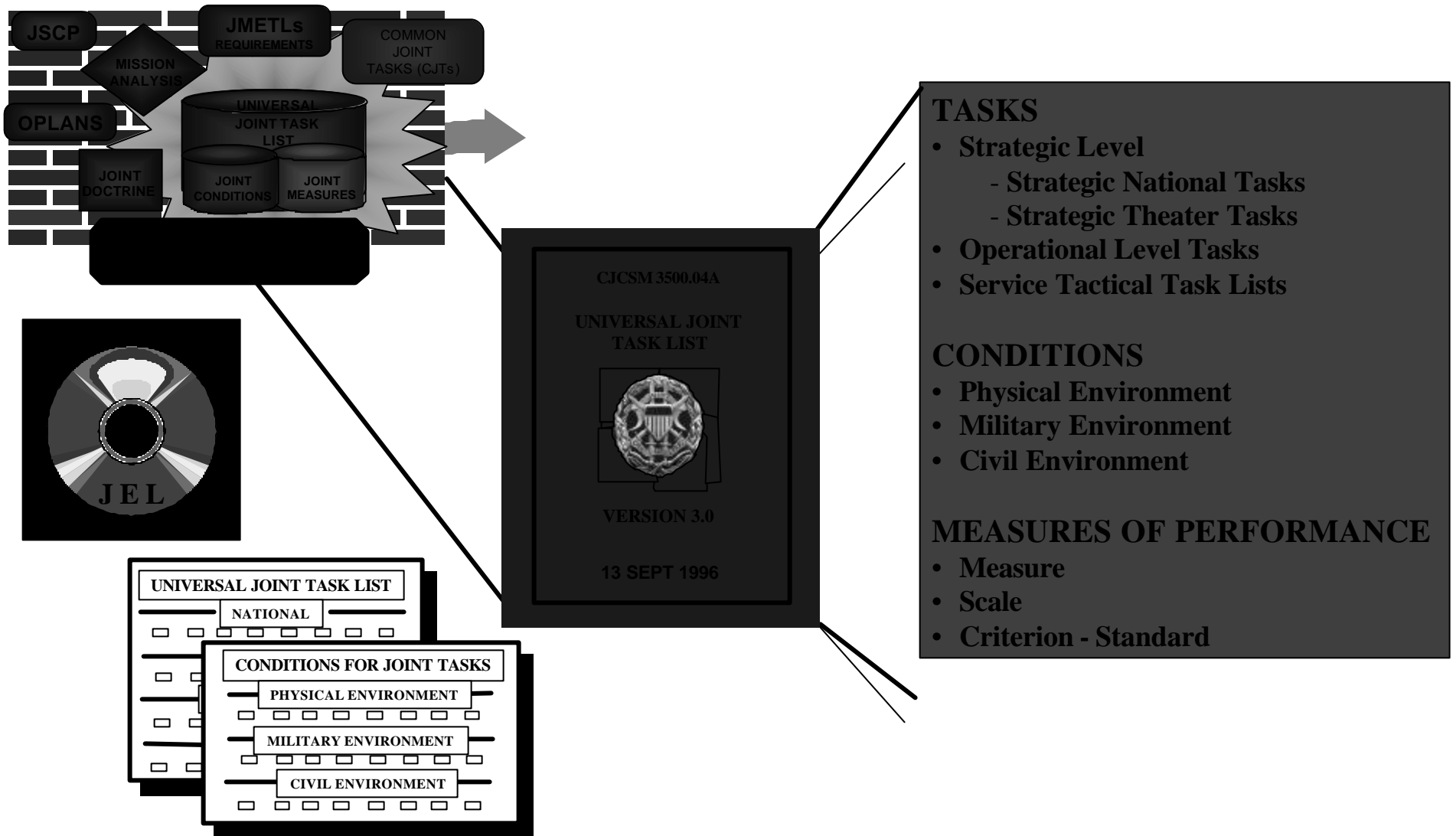
MISSION TRAINING ASSESSMENTS (MTA)



- What is the Problem to be Solved
 - Joint Vision 2010 Context
 - Simulation Development Thread
 - The Nature of the Problems and Solutions
- Training Example
 - Joint Training System (JTS) Context
 - JSEAD Mission Thread
 - Warfighter-to-Engineer Communication
- Test & Evaluation Example
 - Analysis of Alternatives (AOA) Context
 - JSEAD Mission Thread
 - Engineer-to-Warfighter Communication



(UJTL)



DEFINITION OF MEASURE

Measures distinguish among varying levels of task performance. More than one measure may be specified for any single task.

Task:

OP 2.2.1 Collect Information on Operational Situation

Measures:

SCALE	MEASURE
Time	To retask collection asset
Time	Since most current intel. info. was collected
Percent	Of collection requirements filled
Percent	Of collection reqmts filled by multiple sources
Percent	Of targets accurately located
Percent	Of targets accurately identified

MISSION-BASED TASK STANDARDS

Standards express the degree to which (how well) a military organization or force must perform a task* under a specified set of conditions.

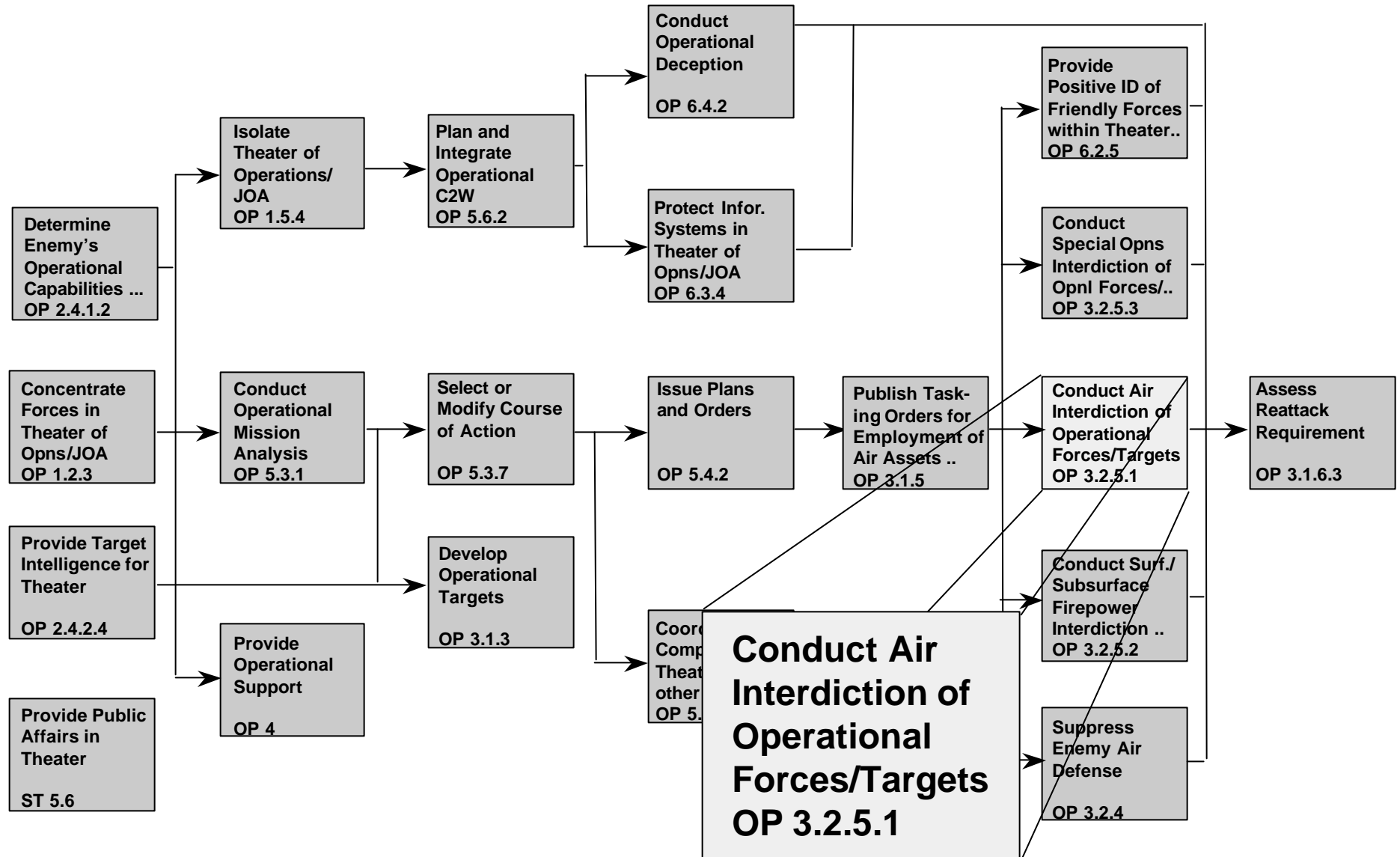
A criterion defines acceptable levels of performance for a measure and is often expressed as a minimum acceptable level of performance.

Standard:

<u>Criterion</u>	<u>Scale</u>	<u>Measure</u>
90 4	Percent Hours	of collection requirements filled since most current intelligence information was collected
85	Percent	of targets accurately located

***e.g.; Collect Information on Operational Situation (OP2.2.1)**

JOINT INTERDICTION TEMPLATE



REQUIREMENTS EXAMPLE

PERFORM TASK OF:

Conduct Air Interdiction of Operational Forces/Targets (OP 3.2.5.1) -
to conduct air operations to destroy, neutralize, or delay the enemy's military potential.

UNDER CONDITIONS OF:

- ❖ **Negligible Light (overcast night)(C 1.3.2.1)** - light available to illuminate objects from natural or manmade sources.
- ❖ **Moderate Personnel Fatigue (C 2.2.4.6)** - degree to which personnel, due to lack of rest, are experiencing fatigue.
- ❖ **Moderate Collateral Damage Potential (C 2.6.7)** - degree to which civilian population and structures (and friendly forces) are close to targets.

TO A STANDARD OF:

- 3 Hours to get ordnance on target after initiation of task
- 95 Percent of missions flown achieve desired target damage
- <5 Percent of engagements resulting in collateral damage
- <2 Percent loss rate in first four days of combat

CURRENT PERFORMANCE

PERFORM TASK OF:

Conduct Air Interdiction of Operational Forces/Targets (OP 3.2.5.1) - to conduct air operations to destroy, neutralize, or delay the enemy's military potential.

UNDER CONDITIONS OF:

- ❖ **Negligible Light (overcast night)(C 1.3.2.1)**
- ❖ **Moderate Personnel Fatigue (C 2.2.4.6)**
- ❖ **Moderate Collateral Damage Potential (C 2.6.7)**

TO A STANDARD OF:

- 6 Hours to get ordnance on target after initiation of task**
- 95 Percent of missions flown achieve desired target damage**
- 10 Percent of engagements resulting in collateral damage**
- 7 Percent loss rate in first four days of combat**

ISSUES:

Improved defenses in 2015 will require new penetration capabilities for Air Interdiction Aircraft. Also, compressed ATO cycle will require faster a/c turnaround times.

ONE POSSIBLE SOLUTION

TASK: Conduct Air Interdiction of Operational Forces/Targets (OP 3.2.5.1)

PROPOSED SOLUTION: Advanced Aircraft

ANALYSIS CONDITIONS:

- ❖ C 1.3.2.1 Light Negligible (overcast night)
- ❖ C 2.2.4.6 Personnel Fatigue Moderate
- ❖ C 2.6.7 Collateral Damage Potential Moderate

PREDICTED PERFORMANCE:

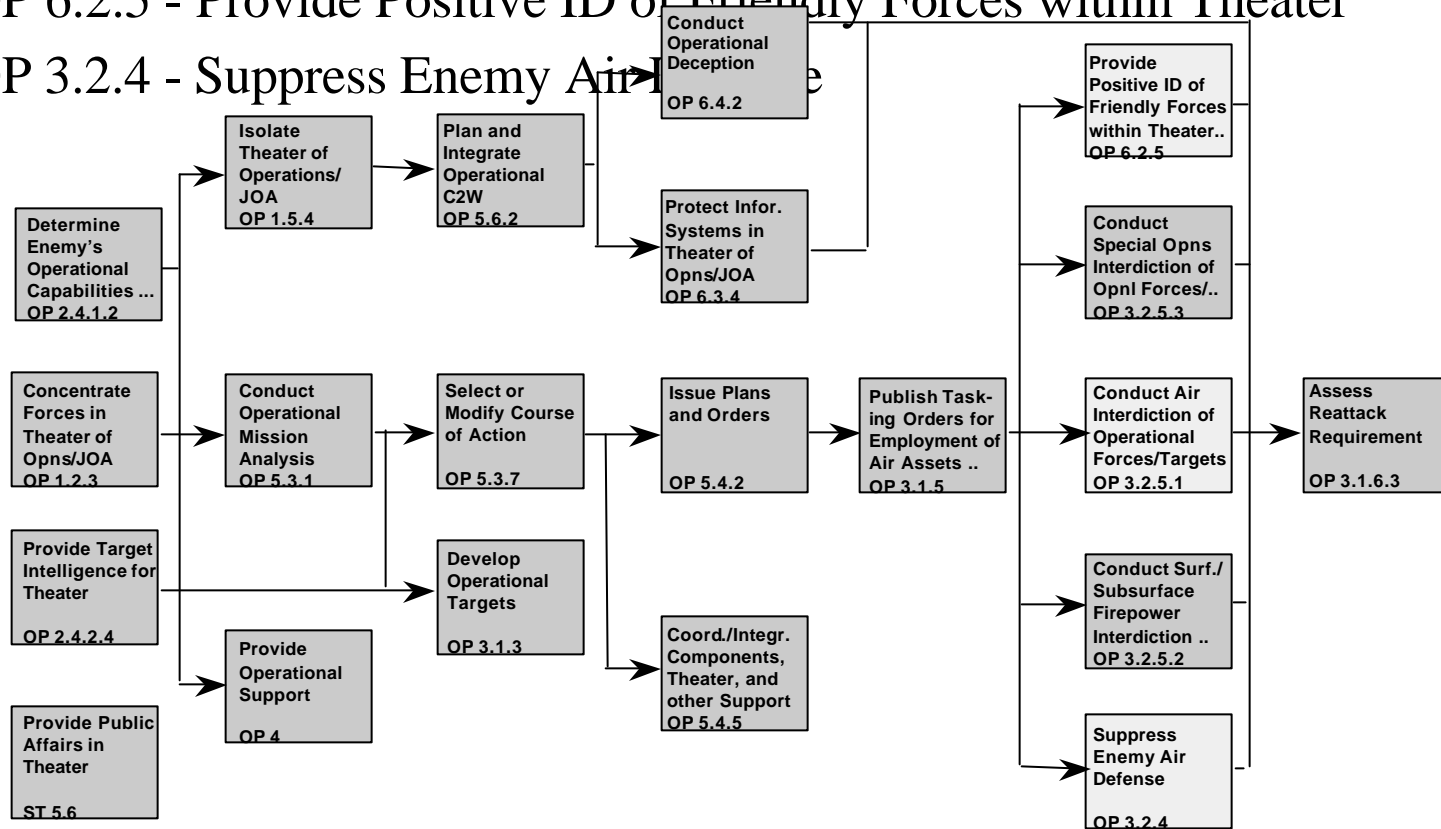
- 4** Hours to get ordnance on target after initiation of task
- 95** Percent of missions flown achieve desired target damage
- 2** Percent of engagements resulting in collateral damage
- 1.5** Percent loss rate in first four days of combat

PERFORMANCE DISCUSSION:

- ❖ Stealth improved penetration
- ❖ Maintaining existing air and ground crew ratios limited turnaround times and TOT Responsiveness

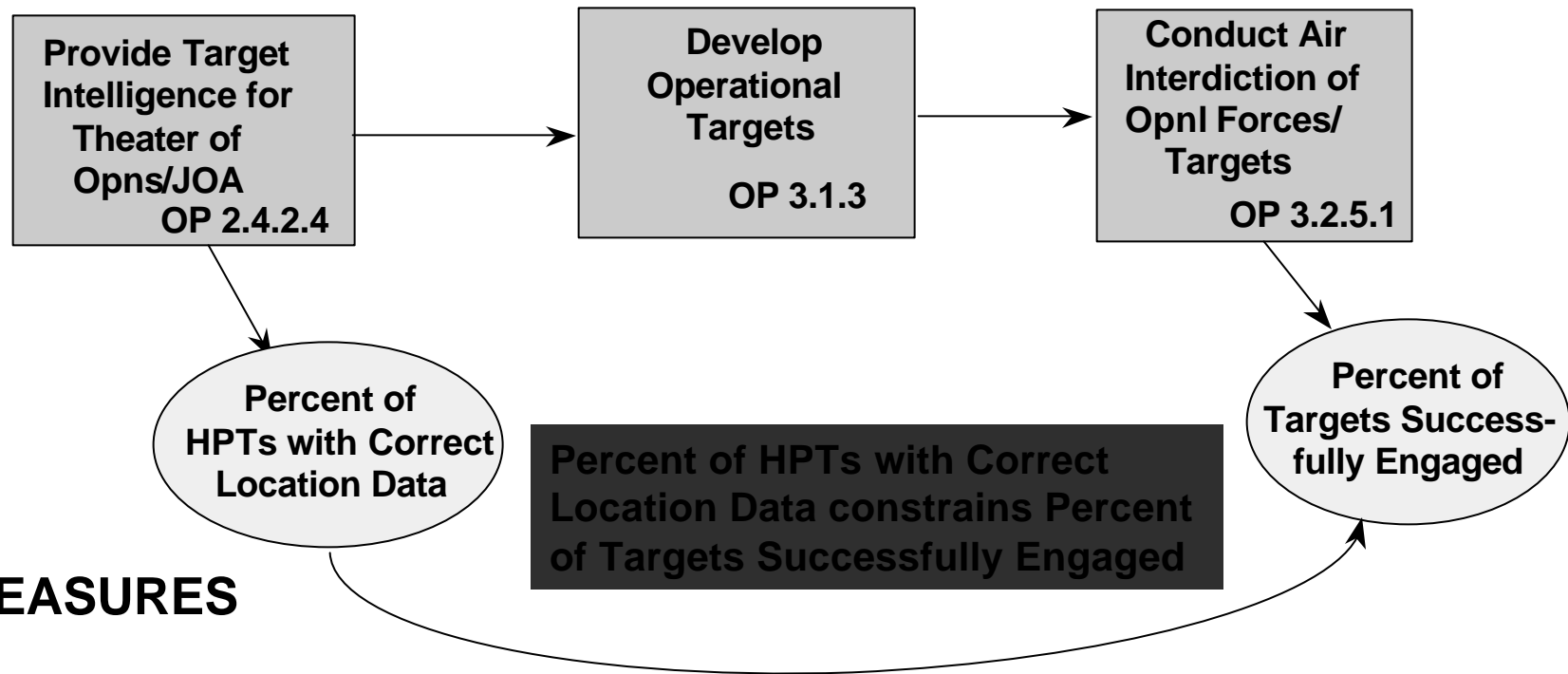
LINKING ACQUISITION OF NEW AIRCRAFT TO TASKS

- Improved mission success by enhancing performance of:
 - OP 3.2.5.1 - Conduct Air Interdiction of Operational Forces/Targets
 - OP 6.2.5 - Provide Positive ID of Friendly Forces within Theater
 - OP 3.2.4 - Suppress Enemy Air Defense



CAUSAL VIEW OF JOINT INTERDICTION

TASKS



- What is the Problem to be Solved
 - Joint Vision 2010 Context
 - Simulation Development Thread
 - The Nature of the Problems and Solutions
- Training Example
 - Joint Training System (JTS) Context
 - JSEAD Mission Thread
 - Warfighter-to-Engineer Communication
- Test & Evaluation Example
 - Analysis of Alternatives (AOA) Context
 - JSEAD Mission Thread
 - Engineer-to-Warfighter Communication